

# New Hampshire Volunteer Lake Assessment Program

## 2003 Interim Report for Dorrs Pond Manchester



NHDES  
Water Division  
Watershed Management Bureau  
29 Hazen Drive  
Concord, NH 03301



# OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **DORRS POND, MANCHESTER**, the program coordinators have made the following observations and recommendations:

Thank you for your continued hard work sampling the pond this season! Your monitoring group sampled **three** times this season and has done so for many years! As you know, with multiple sampling events each season, we will be able to more accurately detect changes in water quality. Keep up the good work!

**Thank you for carrying out one of your most important responsibilities as a volunteer monitor; educating your association, community, and city officials about the quality of your pond and what can be done to protect it!**

## FIGURE INTERPRETATION

- **Figure 1 and Table 1:** The graphs in Figure 1 (Appendix A) show the historical and current year chlorophyll-a concentration in the water column. Table 1 (Appendix B) lists the maximum, minimum, and mean concentration for each sampling season that the pond has been monitored through the program.

Chlorophyll-a, a pigment naturally found in plants, is an indicator of the algal abundance. Because algae are usually microscopic plants that contain chlorophyll-a, and are naturally found in lake ecosystems, the chlorophyll-a concentration measured in the water gives an estimation of the algal concentration or lake productivity. **The mean (average) summer chlorophyll-a concentration for New Hampshire's lakes and ponds is 7.02 ug/L.**

The current year data (the top graph) show that the chlorophyll-a concentration **increased** from May to June and June to August. The chlorophyll-a concentration in May and June was **approximately equal to** the state mean. The chlorophyll-a concentration in August

was **greater than** the state mean, and in the range where we believe your pond was experiencing an algae bloom.

The historical data (the bottom graph) show that the 2003 chlorophyll-a mean is **greater than** the state mean.

- **Figure 2 and Table 3:** The graphs in Figure 2 (Appendix A) show historical and current year data for pond transparency. Table 3 (Appendix B) lists the maximum, minimum and mean transparency data for each sampling season that the pond has been monitored through the program.

Volunteer monitors use the Secchi-disk, a 20 cm disk with alternating black and white quadrants, to measure water clarity (how far a person can see into the water). Transparency, a measure of water clarity, can be affected by the amount of algae and sediment from erosion, as well as the natural colors of the water. **The mean (average) summer transparency for New Hampshire's lakes and ponds is 3.7 meters.**

The current year data (the top graph) show that the in-lake transparency **decreased slightly** from May to June, and then **decreased** in August. The transparency in May, June and August was **less than** the state mean.

The historical data (the bottom graph) show that the 2003 mean transparency is **less than** the state mean.

Typically, high intensity rainfall causes erosion of sediments into lakes/ponds and streams, thus decreasing clarity. Efforts should continually be made to stabilize stream banks, pond shorelines, disturbed soils within the watershed, and especially dirt roads located immediately adjacent to the edge of tributaries and the pond. Guides to Best Management Practices designed to reduce, and possibly even eliminate, nonpoint source pollutants, such as sediment loading, are available from DES upon request.

- **Figure 3 and Table 8:** The graphs in Figure 3 (Appendix A) show the amounts of phosphorus in the epilimnion (the upper layer) and the hypolimnion (the lower layer); the inset graphs show current year data. Table 8 (Appendix B) lists the annual maximum, minimum, and median concentration for each deep spot layer and each tributary since the pond has joined the program.

Phosphorus is the limiting nutrient for plant and algae growth in New Hampshire's freshwater lakes and ponds. Too much phosphorus in a pond can lead to increases in plant and algal growth over time. **The**

**median summer total phosphorus concentration in the epilimnion (upper layer) of New Hampshire's lakes and ponds is 11 ug/L. The median summer phosphorus concentration in the hypolimnion (lower layer) is 14 ug/L.**

The current year data for the epilimnion (the top inset graph) show that the phosphorus concentration **remained relatively stable** in May, June and August. The phosphorus concentration in June, July, and August was **greater than** the state median.

The historical data show that the 2003 mean epilimnetic phosphorus concentration is **greater than** the state median.

The phosphorus concentration for the hypolimnion (the bottom inset graph) in August shows that it was **greater than** the state median.

The historical data show that the 2003 mean hypolimnetic phosphorus concentration is **greater than** the state median.

One of the most important approaches to reducing phosphorus loading to a waterbody is to continually educate watershed residents about its sources and how excessive amounts can adversely impact the ecology and value of lakes and ponds. Phosphorus sources within a lake or pond's watershed typically include septic systems, animal waste, lawn fertilizer, road and construction erosion, and natural wetlands.

#### **TABLE INTERPRETATION**

➤ **Table 2: Phytoplankton**

Table 2 (Appendix B) lists the current and historic phytoplankton species observed in the pond. The dominant phytoplankton species observed this year were ***Ceratium* (a dinoflegellate), *Ankistrodemus* (a green), and *Phacus* (a green).**

Phytoplankton populations undergo a natural succession during the growing season (Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding seasonal plankton succession). Diatoms and golden-brown algae are typical in New Hampshire's less productive lakes and ponds.

➤ **Table 4: pH**

Table 4 (Appendix B) presents the in-lake and tributary current year and historical pH data.

pH is measured on a logarithmic scale of 0 (acidic) to 14 (basic). pH is important to the survival and reproduction of fish and other aquatic life. A pH below 5.5 severely limits the growth and reproduction of fish. A pH between 6.5 and 7.0 is ideal for fish. The mean pH value for the epilimnion (upper layer) in New Hampshire's lakes and ponds is **6.5**, which indicates that the surface waters in state are slightly acidic. For a more detailed explanation regarding pH, please refer to the "Chemical Monitoring Parameters" section of this report.

The mean pH at the deep spot this season ranged from **7.11** in the hypolimnion to **7.03** in the epilimnion, which means that the water is ***approximately neutral***.

➤ **Table 5: Acid Neutralizing Capacity**

Table 5 (Appendix B) presents the current year and historic epilimnetic ANC for each year the pond has been monitored through VLAP.

Buffering capacity or ANC describes the ability of a solution to resist changes in pH by neutralizing the acidic input to the lake. The mean ANC value for New Hampshire's lakes and ponds is **6.7 mg/L**, which indicates that many lakes and ponds in the state are "highly sensitive" to acidic inputs. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

The Acid Neutralizing Capacity (ANC) of the epilimnion (the upper layer) continues to remain ***greater than*** the state mean of **6.7 mg/L**. Specifically, the pond is classified by DES as ***not sensitive*** to acidic inputs (such as acid precipitation).

➤ **Table 6: Conductivity**

Table 6 (Appendix B) presents the current and historic conductivity values for tributaries and in-lake data. Conductivity is the numerical expression of the ability of water to carry an electric current. The mean conductivity value for New Hampshire's lakes and ponds is **62.1 uMhos/cm**. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

**INCREASING CONDUCTIVITY**

The conductivity has ***increased*** in the pond and inlets since monitoring began. In addition, the in-lake conductivity is ***greater than*** the state mean. Typically, sources of increased conductivity are due to human activity. These activities include septic systems that fail and leak leachate into the groundwater (and eventually into the tributaries and the pond), agricultural runoff, and road runoff (which

contains road salt during the spring snow melt). New development in the watershed can alter runoff patterns and expose new soil and bedrock areas, which could contribute to increasing conductivity. In addition, natural sources, such as iron deposits in bedrock, can influence conductivity.

We recommend that your monitoring group conduct stream surveys and storm event sampling along the inlet(s) with elevated conductivity so that we can determine what may be causing the increases.

*For a detailed explanation on how to conduct rain event and stream surveys, please refer to the 2002 VLAP Annual Report "Special Topic Article", or contact the VLAP Coordinator.*

➤ **Table 8: Total Phosphorus**

Table 8 (Appendix B) presents the current year and historic total phosphorus data for in-lake and tributary stations. Phosphorus is the nutrient that limits the algae's ability to grow and reproduce. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

**HIGH TURBIDITY AND PHOSPHORUS IN INLET**

The total phosphorus concentration in the **Lessard Inlet** was slightly elevated on **8/28/03**. The turbidity (Table 11) of the sample was also elevated, which suggests that the stream bottom may have been disturbed while sampling or that erosion is occurring in this portion of the watershed.

When the stream bottom is disturbed, sediment, which typically contains attached phosphorus, is released into the water column. When collecting samples in the inlets, please be sure to sample where there the stream is flowing and where the stream is deep enough to collect a "clean" sample.

If you suspect that erosion is occurring in this portion of the watershed, we recommend that your monitoring group conduct stream surveys and storm event sampling along this inlet. This additional sampling may allow us to determine what is causing the elevated levels of turbidity and phosphorus.

*For a detailed explanation on how to conduct rain event and stream surveys, please refer to the 2002 VLAP Annual Report "Special Topic Article", or contact the VLAP Coordinator.*

➤ **Table 9 and Table 10: Dissolved Oxygen and Temperature Data**

Table 9 (Appendix B) shows the dissolved oxygen/temperature profile(s) for the 2003 sampling season. Table 10 (Appendix B) shows the historical and current year dissolved oxygen concentration in the hypolimnion (lower layer). The presence of dissolved oxygen is vital to fish and amphibians in the water column and also to bottom-dwelling organisms. Please refer to the “Chemical Monitoring Parameters” section of this report for a more detailed explanation.

The dissolved oxygen concentration was **low in the hypolimnion** at the deep spot of the pond. As stratified lakes/ponds age, oxygen becomes **depleted** in the hypolimnion (the lower layer) by the process of decomposition. Specifically, the loss of oxygen in the hypolimnion results primarily from the process of biological breakdown of organic matter (i.e.; biological organisms use oxygen to break down organic matter), both in the water column and particularly at the bottom of the pond where the water meets the sediment. When oxygen levels are depleted to less than 1 mg/L in the hypolimnion (**as in many past seasons**), the phosphorus that is normally bound up in the sediment may be re-released into the water column.

The **low** oxygen level in the hypolimnion is a sign of the pond’s **aging** and **declining** health. This year the DES biologist conducted the temperature/dissolved oxygen profile in **June**. We recommend continued monitoring of the hypolimnion dissolved oxygen concentration.

➤ **Table 11: Turbidity**

Table 11 (Appendix B) lists the current year and historic data for in-lake and tributary turbidity. Turbidity in the water is caused by suspended matter, such as clay, silt, and algae. Water clarity is strongly influenced by turbidity. Please refer to the “Other Monitoring Parameters” section of this report for a more detailed explanation.

The turbidity in the **Lessard Inlet** sample was elevated on **8/28/03**, which suggests that the stream bottom may have been disturbed while sampling or that erosion is occurring in this portion of the watershed.

When the stream bottom is disturbed, sediment, which typically contains attached phosphorus, is released into the water column. When collecting samples in the inlets, please be sure to sample where there the stream is flowing and where the stream is deep enough to collect a “clean” sample.

If you suspect that erosion is occurring in this portion of the watershed, we recommend that your monitoring group conduct stream surveys and storm event sampling along this inlet. This additional sampling may allow us to determine what is causing the elevated levels of turbidity.

*For a detailed explanation on how to conduct rain event and stream surveys, please refer to the 2002 VLAP Annual Report “Special Topic Article”, or contact the VLAP Coordinator.*

### **DATA QUALITY ASSURANCE AND CONTROL**

#### **Annual Assessment Audit:**

The DES biologist did not conduct a “Sampling Procedures Assessment Audit” for your monitoring group. Your monitoring group continues to do an **excellent** job collecting samples. Keep up the good work!

Please see the following helpful hints for a few aspects regarding sample collection:

- **Finding the deep spot:** Please remember to locate the deep spot using three reference points from the shoreline. This method is known as **triangulation**. In addition, depth finders and Global Positioning System (GPS) technology may be used to further pinpoint the location of the deep spot. In addition, please remember to check the depth of the deep spot by **sounding** to ensure that you have actually located the deepest spot. To sound the bottom, simply fill the Kemmerer bottle with lake water from the surface and then lower the bottle into the lake until you feel it touch the bottom. When you have reached the bottom, check the depth on the calibrated chain. You may need to move to another location and repeat this procedure a few times until the deepest spot is located. When you have found the deep spot, please remember to write the depth of the field data sheet. **Sounding may disturb the sediment, so please allow the bottom to settle out before collecting the deepest sample.**
- **Anchoring at deep spot:** Please remember to use an anchor with sufficient weight and sufficient amount of rope to prevent the boat from drifting while sampling at the deep spot. It is difficult for the biologist to collect an accurate and representative dissolved oxygen/temperature profile when the boat is drifting. In addition, it is difficult to view the secchi disk and collect samples from the proper depths when the boat is drifting. Depending on the depth of the pond and the wind conditions, it may be necessary to use two anchors!



- **Hypolimnion (lower layer) sample collection:** Always remember to allow the pond bottom to settle after you sound the bottom before collecting the hypolimnion (lower layer) sample. In addition, please be careful not to hit the pond bottom and make sure that there is no sediment in the Kemmerer bottle before filling the sample bottles. When the pond bottom is disturbed, sediment, which typically contains attached phosphorus, is released into the water column.
- **Secchi disk readings:** When measuring the transparency at the deep spot, please remember to take **at least two** secchi disk readings. Since the depth to which the secchi disk can be seen in the water column can vary depending on how windy or sunny it is, and also on the eyesight of the volunteer monitor, it is best to have at least two people take a reading. In addition, please make sure that the readings are taken on the shady, non-windy side of the boat, between the hours of 10 am and 2 pm.
- **Chlorophyll-a Sampling:** When collecting the chlorophyll-a sample using the **composite method**, please make sure to collect one Kemmerer bottle full of water at each meter from the starting point up to 1 meter from the surface. Specifically, in lakes with one or two thermal layers, begin at 2/3 the total depth and collect water at every meter up to the surface. In lakes with three layers, start at the middle of the middle layer (metalimnion) and collect water at every meter up to the surface.
- **Chlorophyll-a Sampling:** When collecting the chlorophyll-a sample using the **integrated tube method**, please make sure to lower both the weighted end and chain to the appropriate sample depth. Specifically, in lakes with one or two thermal layers, lower the weighted end and chain to 2/3 the total depth. In lakes with three layers, lower the weighted end and the chain to the middle of the middle layer (metalimnion). Crimp the end of the tube tightly and haul the weighted end up *by the chain only*. Lift the *uncrimped* end above your head so the open end is always higher than the water level in the tube to ensure that the sample does not escape out of the top of the tube.
- **Tributary Sampling:** Please do not sample tributaries that are not flowing. Due to the lack of flushing, stagnant water typically contains elevated amounts of chemical and biological constituents that will lead to erroneous results.
- **Tributary Sampling:** Please do not sample tributaries that are too shallow to collect a “clean” sample (i.e.; free from sediment and organic debris). You may need to move upstream or downstream to

collect a “clean” sample. If the stream is not deep enough and the bottom sediment is disturbed while sampling, the phosphorus concentration in the sample will likely be elevated.

In addition, please do not sample tributaries if the bottom sediment has been disturbed as this will likely result in an elevated phosphorus concentration. If you disturb the stream bottom while sampling, please rinse out the bottle and move to an upstream location so that you can sample in an undisturbed area.

### **Sample Receipt Checklist**

Each time your monitoring group dropped off samples at the laboratory this summer, the laboratory staff completed a sample receipt checklist to assess and document if the volunteer monitors followed proper sampling techniques when collecting the samples. The purpose of the sample receipt checklist is to minimize, and hopefully eliminate, future re-occurrences of improper sampling techniques.

Overall, the sample receipt checklist showed that your monitoring group did an **excellent** job when collecting samples and submitting them to the laboratory this season! Specifically, the members of your monitoring group followed the proper field sampling procedures and there was no need for the laboratory staff to contact your group with questions, and no samples were rejected for analysis.

Please see the following helpful hints for a few aspects regarding sample quality control:

- **Sample Holding Time:** Please remember to return samples to the laboratory **within 24 hours of sample collection**. This will ensure that samples do not degrade before they are analyzed. If you plan to sample on the weekend, please sample on Sunday, preferably in the afternoon, and return samples to the lab first thing on Monday morning to ensure that samples can be analyzed within 24 hours. ***E.coli* samples that are more than 24 hours old will not be accepted by the laboratory for analysis.**
- **Sample “Cooling”:** Please remember to bring a cooler with ice when you sample. Samples should be put directly into the cooler and kept on ice until they are dropped off at the laboratory. This will ensure that samples do not degrade before they are analyzed. If you plan to sample on the weekend, please sample on Sunday, preferably in the afternoon, and return samples to the lab first thing on Monday morning to ensure that samples can be analyzed within 24 hours.

**And, please remember that *E.coli* samples that are more than 24 hours old will not be accepted by the laboratory for analysis.**

- **Sample Labeling:** Please make sure to label your samples with a waterproof pen (a black sharpie permanent marker works best), preferably before sampling. Make sure that the ink does not wash off the bottle when exposed to water. If your association has made its own sample bottle labels, please make sure to fold over one corner of each label before placing it on a sample bottle so that the label will not become permanently attached to the bottle. In addition, please make sure that the labels will stick to the bottles when they are wet.

### **NOTES**

- **Monitor's Note (8/28/03):** Faulty DO Meter, no temp or DO taken.
- **Biologist's Note (5/29/03):** Secchi disk not recorded.
- (6/3/03):** The conductivity levels continue to remain very high.
- (8/28/03):** The total phosphorus level at Lessard Inlet was very high.

### **USEFUL RESOURCES**

*Acid Deposition Impacting New Hampshire's Ecosystems, ARD-32, NHDES Fact Sheet, (603) 271-3505, or [www.des.state.nh.us/factsheets/ard/ard-32.htm](http://www.des.state.nh.us/factsheets/ard/ard-32.htm).*

*Aquarium Plants and Animals: Don't leave them stranded.* Informational pamphlet sponsored by NH Fish and Game, Aquaculture Education and Research Center, and NHDES (603) 271-3505.

*Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, NHDES-WD 97-8, NHDES Booklet, (603) 271-3503.*

*A Boater's Guide to Cleaner Water, NHDES pamphlet, (603) 271-3503.*

*Camp Road Maintenance Manual: A Guide for Landowners.* Kennebec Soil and Water Conservation District, 1992, (207) 287-3901.

*Comprehensive Shoreland Protection Act, RSA 483-B, WD-SP-5, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/sp/sp-5.htm](http://www.des.state.nh.us/factsheets/sp/sp-5.htm).*

*Cyanobacteria in New Hampshire Waters Potential Dangers of Blue-Green Algae Blooms, NHDES Fact Sheet, (603) 271-3505, or [www.des.state.nh.us/factsheets/wmb/wmb-10.htm](http://www.des.state.nh.us/factsheets/wmb/wmb-10.htm).*

## OBSERVATIONS AND RECOMMENDATIONS

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2003

*Erosion Control for Construction in the Protected Shoreland Buffer Zone*, WD-SP-1, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/sp/sp-1.htm](http://www.des.state.nh.us/factsheets/sp/sp-1.htm)

*Impacts of Development Upon Stormwater Runoff*, WD-WQE-7, NHDES Fact Sheet, (603) 271-3503, or [www.des.state.nh.us/factsheets/wqe/wqe-7.htm](http://www.des.state.nh.us/factsheets/wqe/wqe-7.htm)

*Iron Bacteria in Surface Water*, WD-BB-18, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/bb/bb-18.htm](http://www.des.state.nh.us/factsheets/bb/bb-18.htm)

*Is it Safe to Eat the Fish We Catch? Mercury and Other Pollutants in Fish*, NH Department of Health and Human Services pamphlet, 1-800-852-3345, ext. 4664.

*Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes*, WD-BB-9, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/bb/bb-9.htm](http://www.des.state.nh.us/factsheets/bb/bb-9.htm).

*Management of Canada Geese in Suburban Areas: A Guide to the Basics*, Draft Report, NJ Department of Environmental Protection Division of Watershed Management, March 2001, [www.state.nj.us/dep/watershedmgt/DOCS/BMP\\_DOCS/Goosedraft.pdf](http://www.state.nj.us/dep/watershedmgt/DOCS/BMP_DOCS/Goosedraft.pdf).

*Proper Lawn Care In the Protected Shoreland, The Comprehensive Shoreland Protection Act*, WD-SP-2, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/sp/sp-2.htm](http://www.des.state.nh.us/factsheets/sp/sp-2.htm).

*Road Salt and Water Quality*, WD-WMB-4, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/wmb/wmb-4.htm](http://www.des.state.nh.us/factsheets/wmb/wmb-4.htm).

*Sand Dumping - Beach Construction*, WD-BB-15, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/bb/bb-15.htm](http://www.des.state.nh.us/factsheets/bb/bb-15.htm).

*Swimmers Itch*, WD-BB-2, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/bb/bb-2.htm](http://www.des.state.nh.us/factsheets/bb/bb-2.htm).

*Through the Looking Glass: A Field Guide to Aquatic Plants*. North American Lake Management Society, 1988, (608) 233-2836 or [www.nalms.org](http://www.nalms.org).

*Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants*, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or [www.des.state.nh.us/factsheets/bb/bb-4.htm](http://www.des.state.nh.us/factsheets/bb/bb-4.htm).

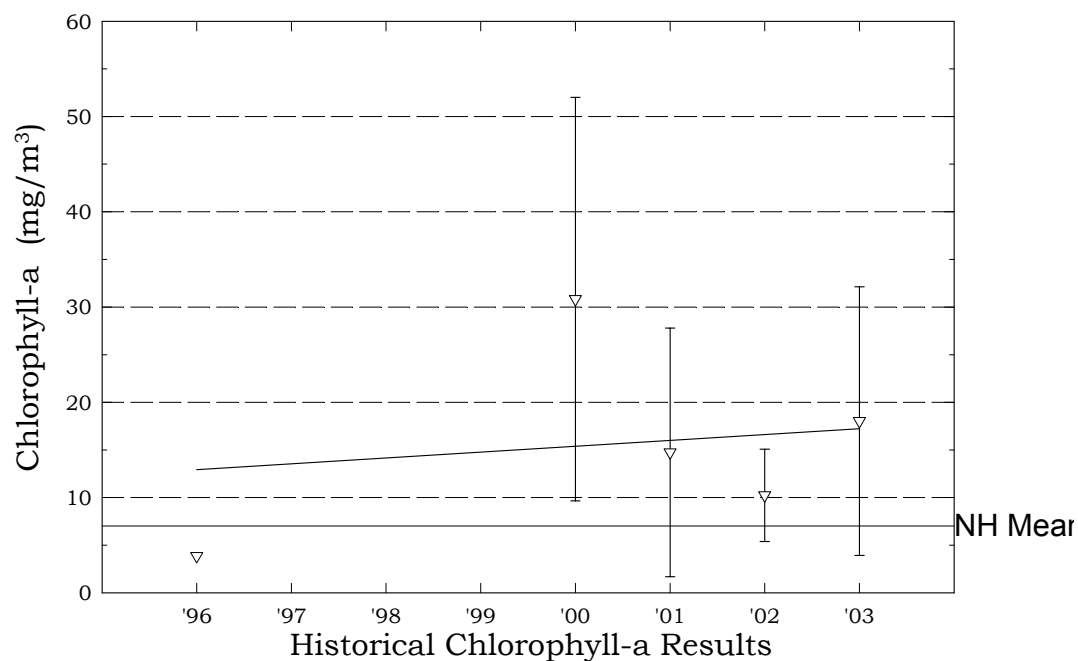
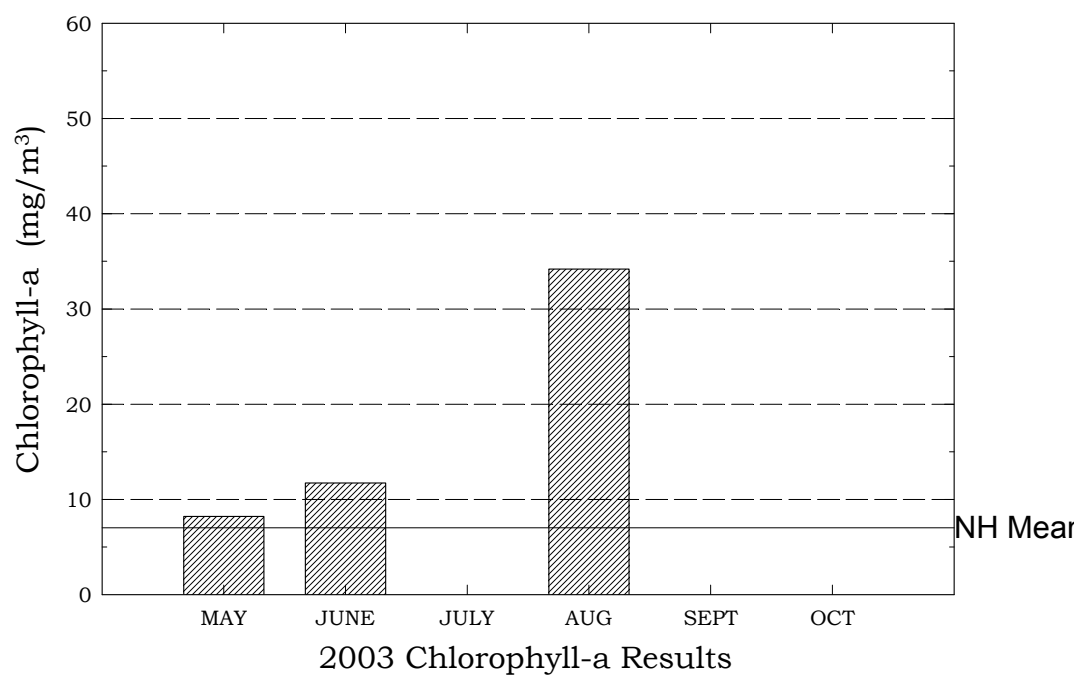
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# APPENDIX A

## GRAPHS

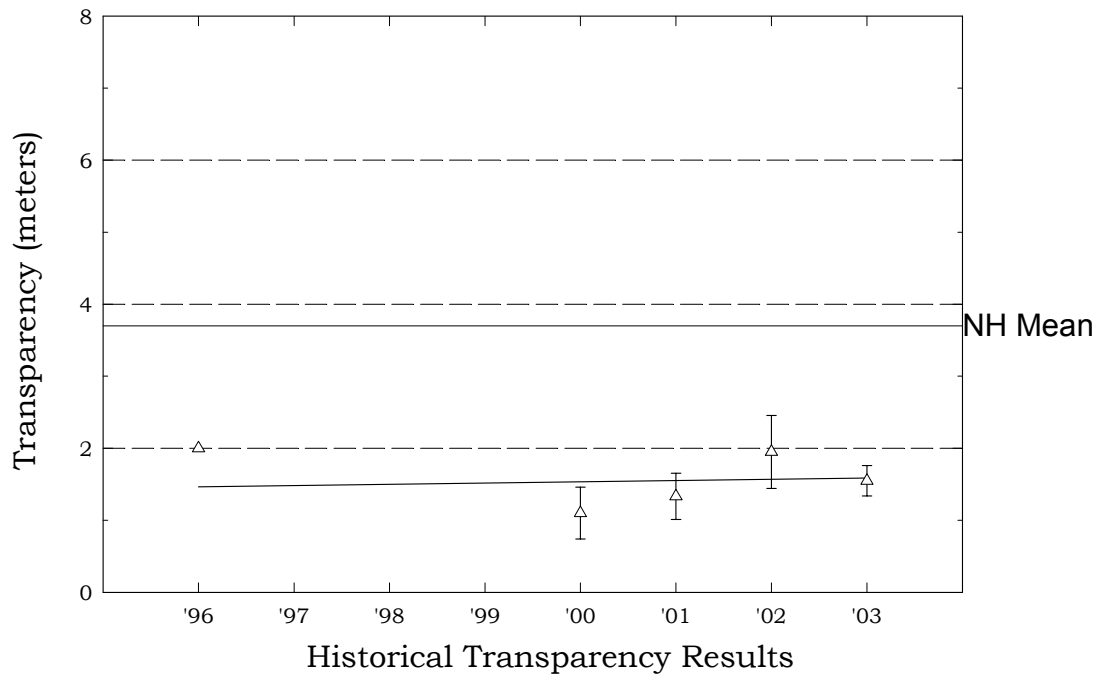
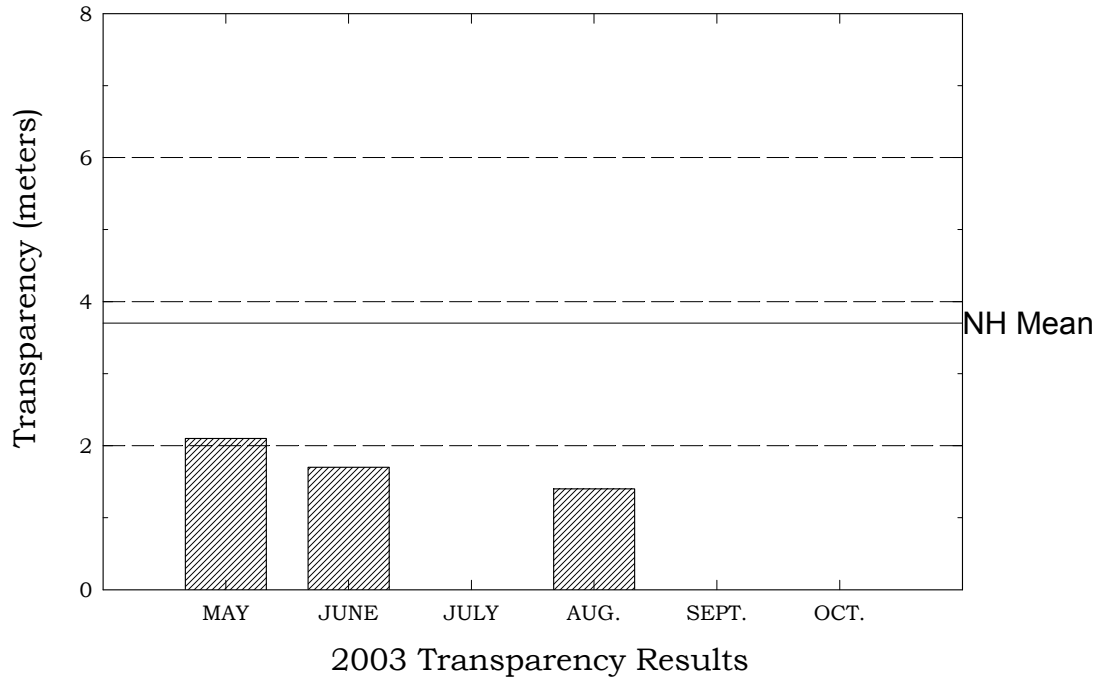
## Dorrs Pond, Manchester

**Figure 1.** Monthly and Historical Chlorophyll-a Results



## Dorrs Pond, Manchester

**Figure 2.** Monthly and Historical Transparency Results



## Dorrs Pond, Manchester

**Figure 3.** Monthly and Historical Total Phosphorus Data.

